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| **Selective Forces** |
| Learning objectives: * Understand how information about form can be used to make predictions about function.
* Understand how differential fitness can changes in population.

Grade 6 standards:* Formulate questions based on observations that lead to the development of a hypothesis.
* Perform measurements using appropriate scientific tools.
* Keep a record of observations, notes, sketches, questions, and ideas such as written and/or computer logs.

Grade 7 standards:* Explain how organisms obtain and use resources to develop and thrive in niches and predator/prey relationships.

Standards:* Formulate questions of how different phenotypes could affect survival
* Explain how populations change over time
* Explain how changes in the environment could change populations over time.

Introduction (for Teachers):The primary goal of this activity is to get kids engaged and get them a chance to see how populations change over time, as well as how environments drive populational changes. The students will play the role of a predator to moths living on the bark of trees. These moths have to major phenotypes a white much lighter coloration and a darker one. This is a historical example of the peppered moth. Where the lighter coloration was the dominant phenotype living primarily on like colored barked trees. However, with increasingly poor air quality with the coming of the industrial revolution this stained and darkened the bark of the trees and killed off many light-colored lichens. There then was a large switch in phenotype proportions towards the favor of darker melanistic moths, due to a selective pressure caused by predation due to the lack of camouflage. In this activity the kids will be acting the part of a visual hunter, where they will hunt colored dots in a certain time frame. The dots will be a dark color (black) and white. And will correspond to the same colored environment in the form of a large sheet of paper on the floor. The dots matching the environment should be harder to see especially under a tight time frame so we should see a driver to the same color dot as the environment. You will need to make sure they don’t have too much time to eliminate all the poorly adapted species therefor fixing the populations. One way to do this is have more teams of less students competing against each other.  |
| Materials: * Large swaths of white and black butcher paper
* Large hole punch (inch diameter)
* Tape
* 4 small pails or buckets.
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| 10 min | **Before class*** + Lay out 2x 4’x4’ swaths of paper in an area. Tape them down.
	+ Hole punch 100 large circles (1”) of each color paper.
	+ The first round lay out equal parts white and black dots on each paper (50 black and 50 white per swath)
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| 30 minutes | **Play*** Welcome the students and tell them that they'll be playing a game today.
* Have the students break up into 2 teams.
* The teams will compete on each swath to pick up as many pieces as they can in 30 seconds as a team. One will be on white paper the other on black. (teams can be scaled up to 4 total teams if needed)
* After the 30 seconds have them place them each teams corresponding colored dot bucket and give a count of each for each team.
* Record these numbers on the board.
* Have the teams collect all the dots in the corresponding buckets to start again
* Take the difference of how many are left on the board of each color and add that number to the dot matching the background. And leave the mismatched dot color to however many are left. (eg. There are 25 black left and 10 white left on the black background the next round has 40 black and 10 white)
* You then run it two more times, and then introduce that both “habitat” (swaths of paper) have changed and give a scenario for each and then keep the dots for each population, run it twice more and then do a final tally.
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| 20 minutes | **Explain/Evaluate*** Now gather the students and have them look at the data (the tally of each round), and see what they observe?
* Go over how you can see that the populations each changed but differently for each environment
* Now go over the fact that this happened in real life! Go over any other examples of changing phenotypes you may enjoy.
* This is the case of the moths, that as environment changes populations change with it.
* Ask students if they can think of other factors that could change in an environment leading to change.
* Ask them to give predictions of what would happen if we kept going with one “environment” or what could happen if the environment changed much later.
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| Closure | * End with a statement about how our impact on the environment effects animals around them. And luckily this species had a form that worked in the new environment. If the environment would have become purple for example it would have been bad for the species in general, there has to be an existing phenotype or form for the species to be able to shift to that form.
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